

CLAIMS

1. Method to assign bandwidth in a point-to-multipoint ATM transmission system having a centralized or Master Station (MS) and a plurality of Peripheral Stations (PSs), in particular to assign bandwidth on the transmission channel from
5 Peripheral Stations (PSs) to the Master Station (MS) assigning time slots through emission of messages called Grants by the Master Station (MS) towards the Peripheral Stations (PSs), the method being organised so that it can preallocate a certain portion of total bandwidth in static modality to various Peripheral Stations (PSs) on the basis of information about active connections but without considering the
10 status of the queues in the various Peripheral Stations (PSs),
characterised by the fact that the Master Station (MS) is structured in a way that allows elaboration of instantaneous bandwidth requirement information or "Requests" sent by Peripheral Stations (PSs) to the Master Station (MS) and distributes bandwidth not assigned with previous static technique according to two additional
15 modalities together defined dynamic bandwidth allocation mode and explicitly described in the following,
- the first additional modality is defined guaranteed dynamical bandwidth and is characterised by a rate of assignment of transmission abilitation or Grants that is prefixed but is real time modifiable according to instantaneous bandwidth
20 requirements notified by each Peripheral Station (PS), in a way that a minimum guaranteed bandwidth defined during connection setup phase is always assigned when requested with precise notification.
 - the second additional modality is called available dynamic bandwidth and assigns bandwidth which is not assigned by the previous techniques sharing it in
25 equal parts among all the Peripheral Stations (PSs) that signal to the Master Station (MS) the need to use the channel from the Peripheral Stations (PSs) to the Master Stations (MS) to send traffic.
2. Method of claim 1, characterised by the fact that the Request that is generated by each Peripheral Station (PS) contains a binary information (empty/not
30 empty) or a multi-bit information (level of fillment) identifying queue status in the Peripheral Station (PS) for those queues that are handled by dynamical allocation scheme; said Request containing, as well or instead, an information representing instantaneous rate of Grants generation for guaranteed dynamic bandwidth, rate that is limited by a maximum value that depends on active connections and is known both
35 in the Master Station (MS) and in the Peripheral Station (PS).

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3. Method of claim 2, where such instantaneous rate is estimated on the basis of incoming rate of ATM cells in the Peripheral Station (PS).

4. Method of claim 2, where such instantaneous rate is estimated on the basis of Peripheral Station (PS) queue fillment level.

5. Method of claim 1, where said Grants allow transmission of one particular Peripheral Station (PS) in one particular time slot on the channel from Peripheral Stations (PSs) to Master Station (MS), so that the Peripheral Station (PS) can send a user traffic cell with associated Request or a Request only or an operation and maintenance cell.

6. Method of claim 5 where said Grants address the Peripheral Stations (PSs) without any distinction related to the type of bandwidth allocation (static, guaranteed dynamic or available dynamic) with which they have been generated in the Master Station (MS) and the Peripheral Station (PS) includes means to choose the queue to be served in correspondence of each Grant that activates its transmission, on the basis of defined priorities and totally autonomously.

7. Method of claim 1, characterised by the fact that preallocated bandwidth is assigned with a fixed rate that is computed on the basis of ATM connection status, using a stored table that is cyclically scanned in the Master Station (MS).

8. Method of claim 1, characterised by the fact that bandwidth assignment mechanism for dynamic traffic is realised on more than one level, all equals and independent from each other, each dedicated to a specific priority level to be used with different classes of traffic.

9. Method of claim 1, characterised by the fact that guaranteed dynamic bandwidth is assigned only to those Peripheral Stations (PSs) that have sent a Request indicating that their queues are not empty and with a rate requested by Peripheral Station (PS) itself within a maximum amount that is negotiated by the Master Station (MS) and the Peripheral Station (PS) during ATM connection setup phase.

10. Method of claim 1, characterised by the fact that available dynamic bandwidth is assigned cyclically and thus in equal parts to all the Peripheral Stations (PSs) that have indicated in a previous Request that their queues are not empty.

11. Method of claim 1, characterised by a retransmission mechanism applicable only to the traffic from Peripheral Stations (PSs) to the Master Station (MS) and realised through acknowledge messages that identify wrongly received cells and proper Retransmission Grants sent to Peripheral Stations (PSs) that had sent

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incorrectly received cells.

12. Method of claim 11, characterised by the use of a reordering buffer in the Master Station (MS) to reinsert retransmitted cells in the correct order and a retransmission buffer in each Peripheral Station (PS) to store transmitted cells waiting
5 for an eventual retransmission.

13. System to assign bandwidth in a point-to-multipoint ATM transmission system having a centralized or Master Station (MS) and a plurality of Peripheral Stations (PSs), in particular to assign bandwidth on the transmission channel from Peripheral Stations (PSs) to Master Station (MS) assigning time slots through
10 emission of messages called Grants by the Master Station (MS) towards the Peripheral Stations (PSs), the system comprising means to preallocate a certain portion of total bandwidth in static modality to various Peripheral Station (PSs) on the basis of information about active connections but without considering the status of the queues in the various Peripheral Stations (PSs),

15 characterised by the fact that the Master Station (MS) includes additional means that allow elaboration of instantaneous bandwidth requirement information or "Requests" sent by Peripheral Stations (PSs) to Master Station (MS) and that allow distribution of bandwidth not assigned with previous static technique according to two additional modalities together defined dynamic bandwidth allocation mode and explicitly
20 described in the following,

- the first additional modality is defined guaranteed dynamical bandwidth and said additional means are structured in a way to generate a rate of assignment of Grants that is prefixed but is real time modifiable according to instantaneous bandwidth requirements notified by each Peripheral Station (PS), so that a
25 minimum guaranteed bandwidth defined during connection setup phase is always assigned when requested with precise notification.
- the second additional modality is called available dynamic bandwidth and said additional means are structured in a way that allow assignment of bandwidth which is not assigned by the previous techniques by sharing it in equal parts
30 among all the Peripheral Stations (PSs) that signal to the Master Station (MS) the need to use the channel from Peripheral Stations (PSs) to the Master Station (MS) to send traffic.

14. System of claim 13, characterised by the fact that the Peripheral Stations (PSs) comprise means to generate a Request information to be sent to the Master
35 Station (MS) upon request by the Master Station (MS) itself and containing a binary

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information (empty/not empty) or a multi-bit information (level of fillment) identifying queue status in the Peripheral Station (PS) for those queues that are handled by dynamical allocation scheme; Request containing, as well or instead, an information representing instantaneous rate of Grant generation for guaranteed dynamic bandwidth, rate that is limited by a maximum value that depends on active connections and is known both in the Master Station (MS) and in the Peripheral Station (PS).

as of claim 12
 a 15. System of ~~claims 12 and 13~~, characterised by the fact that means to assign guaranteed dynamic bandwidth comprise:

- 10 • counting means that is a block of downcounters, one for each Peripheral Station (PS) that is handled by the Master Station (MS), that are preset to a starting value when new connections are activated and are decremented at each time of a slot on the channel from Peripheral Station (PS) to Master Station (MS), being reset to starting value after having reached the 0 value;
- 15 • decoding means that activate an output when a counter reaches the 0 value;
- memory means to store queue status sent by the Peripheral Stations (PSs);
- checking means that activate an output when decoding means associated to a particular Peripheral Station (PS) are activated and queue status of the same Peripheral Station (PS) is not empty and are able to generate a transmission grant to the Peripheral Station (PS) when the conditions are met.

20 16. System as of claim 15, characterised by the fact that the Master Station (MS) comprises means able to temporarily increment starting value of the downcounter of a particular Peripheral Station (PS) on the basis of precise indications received by the Peripheral Station (PS) itself as a Request.

25 17. System as of claim 15, characterised by the fact that said counting means, decoding means, memory means and checking means are in a number equal to traffic priorities that the system must be able to handle.

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